

INTEGRATING STUDENTS THROUGH A MULTIDISCIPLINARY DESIGN PROJECT

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ABSTRACT: Design as a multidisciplinary endeavour needs to be reflected in learning and teaching strategies within higher education. This paper discusses a design project where quantity surveying (QS) and architecture students worked together on a proposal for a prototype Almshouse for the 21st century. The two groups of students worked alongside a client, and members of the local community, integrating context and content through one design project in an attempt to break down perceived professional and educational silos. The project and learning processes were recorded through student feedback, module evaluation and workshop observation. The project exposed both sets of students to each other's disciplines, where the architecture students were engaged with the budget and the QS students were engaged in the design process. The authors discuss their experience of delivering this particular multidisciplinary project and how the experience might influence a future curriculum involving integration of disciplines and the use of live projects in built environment education. As such this paper focuses less on the physical outcomes of the project, and more on the ongoing dialogues within built environment education that talk of multi and interdisciplinary approaches to design, how they might be more readily adopted through learning and teaching strategies, and the challenges this approach continues to represent for higher education.

Keywords – integration, multidisciplinary, design, challenge

1. INTRODUCTION

There remains an acknowledged need to deliver integrated built environment education that reflects the multidisciplinary nature of the built environment professions through strategies for learning and teaching (Chapman, 2009). The construction industry contains a complex and fragmented group of professions whose roles lie in the operation, preservation and development of the built environment (Hartenberger et al., 2012: 61). Quantity surveyors (QS) and architects are but two of these professions. This paper outlines a project developing peer learning across these two disciplines, where level 6 QS students and level 5 architecture students worked on a single design project, incorporating practical applications of theory into module delivery in order to address some of the recent criticism concerning the lack of cross disciplinary working and interdisciplinary learning (Hill et al., 2012). The aim of the collaboration was to enable both sets of students to engage in a design project and process that reflected a multidisciplinary professional context. The project adopted a multidisciplinary approach in terms of student cohort and in addition offered an opportunity to capture the wider issues regarding the role of the live project within built environment teaching (University of Sheffield, 2016).

The literature suggests a lack of consistency in the use of the terms multi and interdisciplinary (Yocom et al., 2012), and in part this is understandable given the close nature of these approaches. For the purposes of this paper the term multidisciplinary has been adopted, mainly as this honestly reflects the nature of the relationship among the students, where student interaction and

collaboration adopted a 'natural' position in terms of professional interaction, with the QS students largely playing the professional role of a QS and the architecture students focused on design, site layout, and material specification. In this respect the students retreated to their familiar disciplinary territories between the collaborative workshops. The impact of students adopting this approach and how it manifested in outcomes is unpicked throughout this paper.

In 2014 teaching staff on the undergraduate architecture course were approached by a local housing charity and asked if students could take part in a 'live' design project. Staff agreed as this represented a valuable opportunity for students to engage in the issues raised by an ageing population as well as an opportunity to connect with a wider local community. Staff had previous experience of working on live community projects with students and understood the benefit client engagement in the studio could bring to a project brief. A process of design that "is more dialogic and inclusive than traditional studio projects, allowing and embracing alternative voices in the studio environment" (Sara, 2006: 1). Live projects are a device used widely in architectural education both at undergraduate and postgraduate level. The benefits of live project work are well documented and are embedded within many architecture courses such as those run by the University of Sheffield, University of East London and Oxford Brookes to name only three. The University of Salford additionally embed a multidisciplinary project across the second year of their undergraduate built environment courses. Live projects involving client and community engagement manifest a need to adopt an approach that crosses disciplines and involves multiple agents (Anderson and Priest, 2012). Whilst a multidisciplinary design project does not need a client, a live project does need a multidisciplinary approach.

For the project discussed here it made sense for the client, a charity keen to explore the possibilities of designing prototype Almshouses, to engage the next generation of architects in a bid to generate new approaches. For the students the brief represented a challenge, particularly as there was a very realistic constraint, a budget of £70,000 per unit. This budget constraint presented an obvious opportunity for collaboration with QS students, a collaboration that would enable the project outcomes to be potentially more useful to the client. As well as realistic project costs the other perceived benefit of collaboration was the opportunity of working with other students within the same department, enabling a breaking down of perceived educational silos and professional barriers (Pooley, 2015), whilst addressing the need raised in recent years calling for a new professionalism within the industry with a more holistic approach (Bordass and Leaman, 2012). The Farrell Review (2014), further highlighted a need for greater design literacy for those making decisions about our built environment and here the benefit of a multi, inter or transdisciplinary approach can be maximised. This project was an attempt to address that perceived deficit through multidisciplinary teaching, addressing societal issues of housing for an ageing population and incorporating collaboration with a 'real' client and community. This is an issue Bauman (2008) identifies as lacking in architectural education when she questions design tutors over their limited exploration of housing and sustainability. Hartenberger et al. additionally comment:

The education and training of built environment professionals needs to strengthen the understanding of the consequences of one's own actions. These actions not only impact on society and the environment in general, but also on the specific objectives and scope of others at later stages in the value chain

2. PROCESS

The success of the project largely rested on the commitment of the module leaders who identified an opportunity to bring professional reality into an academic process. The process of collaboration involved mapping the learning outcomes (LOs) for both modules, writing the project into the module guides and presenting the outline project brief to both groups of students. The QS undergraduates undertook the project through a level 6 module entitled Design Economics - an established key objective of this module was to gain knowledge and understanding of cost planning and control activities during the design phase of a construction project. QS students on the BSc (Hons) Quantity Surveying course learn the background necessary for offering advice to clients or the design team on matters concerning economy, cost or price at the various stages of a design process. It was intended that this collaborative exercise would provide the background necessary for offering this advice. The LOs for the module were:

1. Identify and evaluate alternative development opportunities for Quantity Surveying skills
2. Evaluate conceptual economic principles and relate these to the practical requirements for the design and development of buildings.
3. Apply appropriate techniques and data at various stages of the development and design process in order to analyse design and development problems and offer appropriate advice.
4. Demonstrate a range of skills in relating techniques and data to resolve practical development problems and produce appropriate calculations and reports in response.

Architecture undergraduates undertook this project as part of their level 5 module entitled Architectural Design Studies 2. The key objective of this module was to develop designs for small scale projects based in the local community. The LOs for architecture students were:

1. Create and prepare architectural designs, working with the existing site and taking into account the wider context of the proposal.
2. Demonstrate an understanding of the fine arts, as well as architectural history and theory and its application to architectural design at various scales.
3. Consider professional values and ethics and how these affect our built environment, taking into account the challenge of creating sustainable and inclusive proposals.
4. Demonstrate skills of preparing detailed drawings of key building components, showing structural principles and the specification of materials, using a variety of media and techniques, such as sketching, drawing and model making.

Both modules were delivered over a twelve week semester, with three hours of staff contact per week. In addition to module learning outcomes and definitions, both modules formed part of a course with professional body requirements and criteria – the QSs through the Royal Institution of Chartered Surveyors (RICS), and the architects through the Architects Registration Board (ARB). ARB general criteria specifically relate to costs, stating that the architecture graduate will have the skills to:

- critically examine the financial factors implied in varying building types, constructional systems, and specification choices, and the impact of these on architectural design;

- understand the cost control mechanisms which operate during the development of a project (ARB, 2014: 6)

As the LOs for each module inevitably varied, the mapping of the proposed project was demonstrated through a shared understanding of the design process. Understanding and engagement with the design process was mapped against LOs 2 and 3 for the QS students, and LOs 1 and 3 for the architecture students. For the architecture students the project was mapped against the need for an understanding of wider context and consideration of professional ethics and values – which in this case included cost considerations. As 50% of the LOs for each module could be collaboratively addressed through the project, and the remaining outcomes addressed through the coursework, the use of the live project and multidisciplinary approach seemed appropriate and ambitious enough to be challenging both for staff and students.

In total the QS undergraduates had four items of coursework for the module, the first three submissions related to the project work, with a final exam at the end. The three items of coursework which related to the collaborative project were:

- An order of cost estimate with elemental cost breakdown submitted at the end of week 4 – a pass/fail awarded (not fine graded)
- Cost plan 2 with cost controlling recommendations submitted at the end of week 7 – a pass/fail awarded (not fine graded)
- and a reflective commentary and discussion on the pre-construction cost planning and controlling process they undertook submitted at the end of week 11 – fine graded and weighted at 50% of the module mark

Architecture students had two items of coursework for the module:

- A short drawing and design project involving their room submitted week 3 – fine graded and weighted at 30%
- A design proposal for Almshouses in Chelmsford to be presented and submitted week 12 – fine graded and weighted at 70%

As the cohorts varied in size, with 68 QS students and 27 architecture students, it was necessary to form groups whereby each architecture student was working with at least two QS students, with some groups comprising of three QS students and one architecture undergraduate. In total twenty-seven multidisciplinary groups were formed. The uneven weighting of QS students to architecture student led to some disparities and difficulties both in the organisation and ambition of the groups. An additional difficulty when forming these groups was that the architecture module was delivered over two days – Wednesday and Friday – with the majority of the architecture students timetabled to attend on a Wednesday, which was the only day the part time QS students were in university. Whilst this happy timetabling coincidence worked for the Wednesday cohort it did disadvantage the Friday groups who rarely got to meet in person, mainly relying on email and the VLE to communicate – with the odd passed message between fellow students.

Once the group size and composition was decided the project was then mapped against the professional processes of design development and cost estimates (see figure 1 below). This was done in order to assist in structuring the process and to enable the QS lecture series to continue as planned.

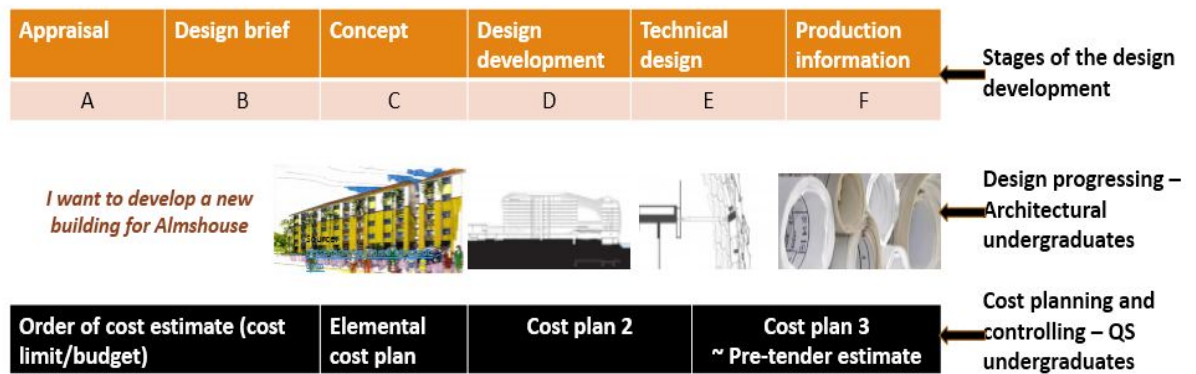


Figure 1: Activities of Architects and Quantity Surveyors during the project – (RIBA work-stages were recast in 2013).

An additional programme was developed by module leaders and issued to all students, this programme highlighted the workshops where exchanges of information could take place within the groups, and the staff responsibilities to enable this (see figure 2 below). Students were fully aware of what they needed to produce for each meeting, and the teaching week it was required. This timetable was regularly reinforced during seminar discussions and placed on the VLE.

QS/ADS2 joint project semester 2 2014-15
Key dates for submission of information

updated: 12/01/2015

■ QS student action
■ ADS student action
■ Nadeesha/Alison

The Almshouse Reimagined: new housing for £70 000

Task:	Day:	Deadline:	TW1	TW2	TW3	TW4	TW5	TW6	TW7	TW8	TW9	TW10	TW11	TW12
Issue brief to QS students	Wed	04/02/2015												
Issue brief to ADS2 students	Wed/Fri	04+06/02												
QS students submit outline budget	Wed	25/02/2015												
ADS2 students issued with outline budget	Wed/Fri	25+27/02												
ADS2 students work on outline plans*														
ADS2 students submit outline plans*	Wed/Fri	11+13/03												
QS students issued with outline plans*	Wed	18/03/2015												
QS students price outline plans*														
QS students submit revised cost plan	Wed	15/04/2015												
ADS2 students issued with revised cost plan	Wed/Fri	15+17/03												
ADS2 students submit response to costs**	Wed/Fri	15+17/03												
QS students issued with ADS2 response to costs**	Wed	22/04/2015												
QS students submit reflection on process	Wed	29/04/2015												
ADS2 students submit final design proposal	Wed/Fri	06+08/05												

* to include: number of units, general arrangement of site (including no. of storeys), indication of materials to be used in construction, foundation types, services (including lifts)
 ** this is to be a written/drawn short reflection on the revised costs and the process to be produced during the studio session in conjunction with the module tutors

Figure 2: Programme for exchange of information between student cohorts and staff throughout the 12 week semester

One of the ambitions for the collaboration was to reflect the professional process of information exchange within the early stages of a project. This ambition was later identified as disadvantaging as it unwittingly embedded an opportunity for lack of communication, or miscommunication, between students during a workshop sessions – setting them up with opposing rather than collaborative aims. As Yocom et al (2012:22) discuss, during cross-disciplinary projects “miscommunication can emerge “as a barrier to interdisciplinary collaboration”, which was experienced. The programme also allowed for the final two weeks to be dedicated to a shared reflective exchange, where students would have an opportunity to discuss their experiences of the process, particularly valuable where it had not all gone quite to plan. For the QS students this final reflection was embedded in their assessment so represented a

required effort in order to pass the module. The reflective opportunity for the architecture students did not carry as much weight in assessment and so for them was lost in the pressure of a fraught end of semester.

3. CHALLENGES

An exploration of the challenges faced implementing this project led them to be grouped into six key issues:

- the QS students were level 6 mostly part-time with professional experience
- the architecture students were level 5, all full time bar one student, they had little experience of professional practice
- disparity in group size with 68 QS students and only 27 architecture students, each architect had to work with at least 2 QS students
- potential disparity in ambition – QS students were nearer to completion of their degree, only had one day a week at university, and were largely sponsored by their employer
- architects have their own ways of designing and focused on problem based learning
- cost control procedures are more structured, with a clearer pathway and end goal

It is common place for full time students to often be working part time, whereas part time students have to balance study and work commitments with only one day a week at university. Initially they may seem at a disadvantage but as Yung et. al. (2015) found the positive benefits of work experience for part time students, particularly for QS students, can place them at an advanced level of understanding. As the project unfolded it was an obvious challenge for QS students working alongside less experienced architecture students who lacked that same level of understanding. Cost planning and control is structured, requiring specific information, QS students commented they “need design information”, which the architecture students were unable to provide, despite being reassured that the level of information initially only had to be outline for the process to start. An overheard comment aimed from a frustrated QS student to an architecture student - who had not produced drawings but declared to have lots of ideas – was “I can't price ideas”. Not all ‘ideas’ were exchanged with the QS students during the weeks indicated in the programme, QS students perceived the architecture students' inability to produce timely information as holding them back. The quality of drawings also caused frustration for the QS students, one commenting that his architect had “done his drawing on serviette paper”.

Frustration caused tensions in the groups where the architecture student could not produce timely design information. This miscommunication did indeed damage collaborative working, with some QS students choosing to disengage with their tardy architect and join a different group, whilst other QS students imposed standardised materials and layouts in order to progress the design and hence the pricing. As the programme started to slip for some groups module leaders identified four architecture student projects –produced on time – and made those projects available as an alternative for the QS students to use which enabled them to complete the coursework. These projects (see figure 3 below) in turn acted as an example for the remaining architecture students. Despite this intervention QS students felt they had “already lost [a] few weeks”. The lack of continuity in some groups prevented those students from

experiencing the true nature of the process.

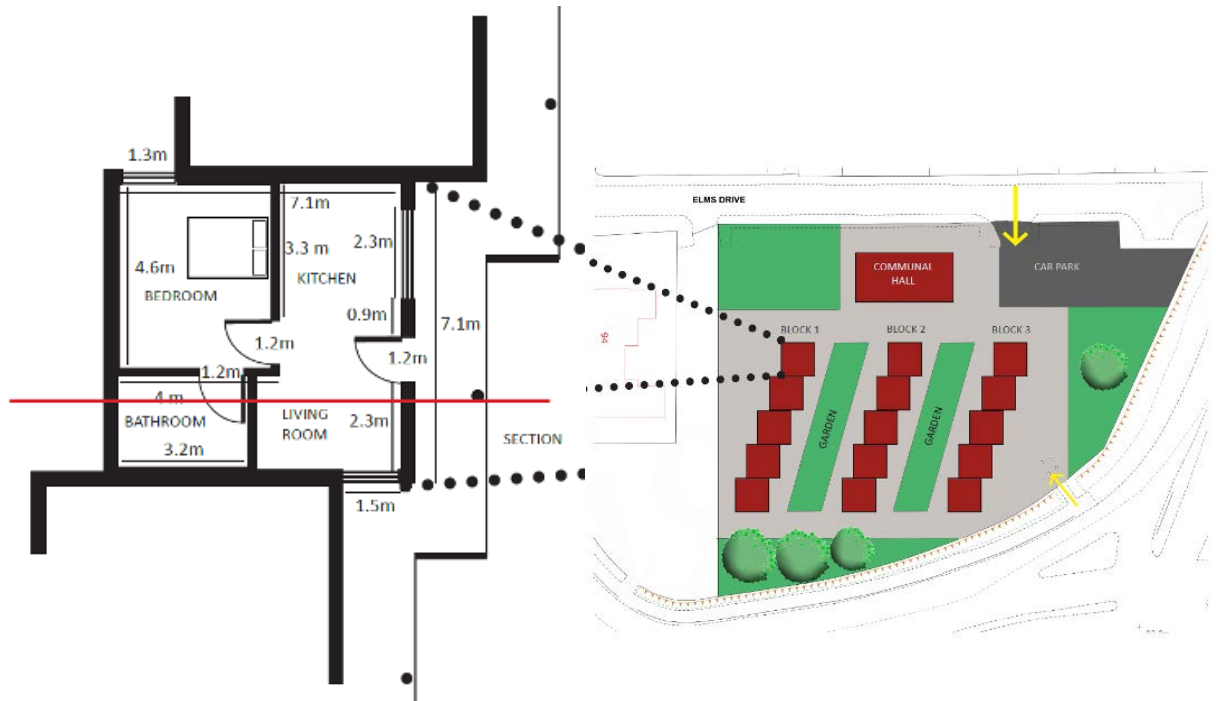


Figure 3: Example of one early stage architecture student project that the QS students chose to work with

QS students found “working with architects frustrating ... my work depended on their performance” and that “better organisation of meetings with architects” was required and “better organisation for deliveries by both groups”. One student commented “the idea of us [QS undergraduates] liaising/working in collaboration with architecture students ... in reality it has not worked for myself”. The new assessment strategy was another challenge, with QS students preferring “regular/usual assignments that [are] easy to understand”. Although QS students had experience of group work leading to a single outcome in their working life, the nature of collaboration for this multidisciplinary project was perceived as very different as it led to an individual outcome - their degree classification.

4. ASSESSMENT OUTCOMES

Observation, discussion, formal module evaluation questionnaires, and student performance were used to evaluate this project. The outcomes are discussed within each discipline as assessment tasks varied.

4.1 Quantity surveyors

Module leaders anticipated an apprehension around assessment and measures were taken to avoid any impact on student performance. Student groups were flexible to allow for regrouping if necessary and QS students were assessed for their knowledge and understanding of the processes for the first two submissions (the order of cost estimate and cost plan 2) and not merely for the accuracy of their answers, in addition these two submissions were not fine graded, the third submission was a reflective commentary and discussion on the pre-construction cost planning process. Students’ learning and the confidence of their knowledge of cost planning and control improved compared to the previous year. Students were confident about their third submission - a reflective commentary and discussion - and there were fewer requests to read

draft versions than there had been with previous cohorts. The pass rate for the module was 98% with an average 68% for coursework and 62.5% for the exam (see figure 4 below). Extensive formative feedback during workshops and other activities allowed students to provide the required cost consultation for the 'live' project.

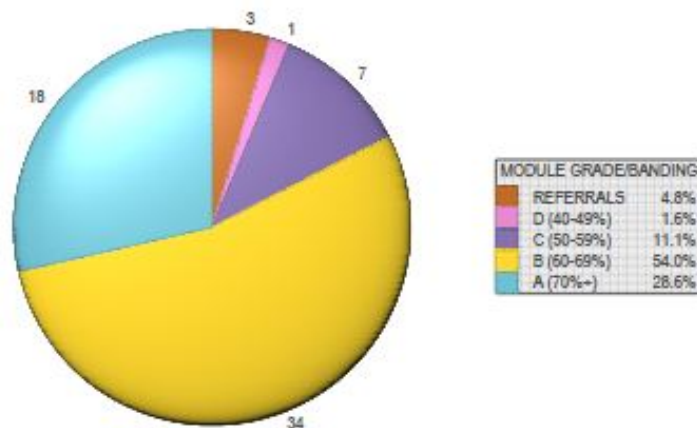


Figure 4: Quantity surveying student performance for the module

Students were given an opportunity to acknowledge inaccuracies within the first two submissions due to lack of design information and were assessed for their knowledge of the process. This assessment strategy improved students learning on the cost planning and control process and helped students to achieve the learning outcomes. Despite the positive performance, student satisfaction for this module - in particular the assessment - was poor. Students thought the module was "not well organised" and emphasised the need for "a clear structure" for the assessment. Module leaders observed that students panicked at having to rely on other students to complete their work, as it was perceived this would have a negative impact on grades achieved. The project was designed in a way that any impact was mitigated through the use of reflective assessment tasks, exemplar projects, and flexibility in swapping groups.

4.1 Architects

Organisation was less of an issue for architecture students, with course organisation scoring 93.3%, and overall module satisfaction at 100%. One student commented:

I like that the clients are involved in our project. Having the quantity surveyors come in also made the project feel more realistic. One was really helpful and gave me suggestions how to change the building to lower costs (Architecture student)

The submission rate for the architecture students was low, with 43% not submitting at first attempt, applying for an extension or mitigating circumstances. This was later identified as being due in part to the pressures of other module coursework. The average mark was 54%, reflecting the challenging nature of the brief, process, and students' design experience at level 5. Input from the QS students, although initially daunting, became a useful tool for some architecture students, helping to develop proposals and confidence in ideas. Reflective comments, which did not form part of the assessment, emerged after submission when students presented their work at a meeting of the National Almshouse Association (NAA) and a regional meeting of

the Housing Learning and Improvement Network (LIN). One architecture student went on to work with the client to produce drawings for the charity based on her design proposal – the only one which had come in under budget. Another student was offered a placement with a QS employer as they had been impressed by their work and professional attitude. Extracts from the module evaluation questionnaire capture the bifurcated feelings of the architecture students:

Q. What do you most like about the module?

A. *Use of an actual site and working with the quantity surveyors.*

Q. Any suggested improvements or changes the module leader or tutor can make?

A. *Not to work with the quantity surveyors.*

5. DISCUSSION

A 'live' project with a 'real' client requires reflexive teaching and flexible module planning (Sara, 2006). A 'live' project can have diverse outcomes for design teaching as outlined by Anderson and Priest (2012), who emphasise the richness in adopting live projects in design teaching. Our short project went beyond design teaching to encompass a cross disciplinary response to a live project brief. Architectural teaching has a strong tradition of problem based learning (PBL), which stems from learning-by-doing, and is rooted in theories of experiential learning (Kolb, 1993; Dewey, [1938] 1997). PBL reflects the way people learn in everyday life – utilising what is referred to as functioning knowledge (Biggs, 2003: 43) and this reflects the heuristic nature of the construction industry which specifically reinforces multidisciplinary working, not always embedded in the curriculum. As “the fabric of design and planning education continues to stretch and adapt to the evolving interests of faculty, students, and communities, the curricula of our professional programmes must respond accordingly” (Yocom et al., 2012:22). As the nature of the industry changes and societal pressures flex so must the curriculum.

The issue of prior learning is key and reflected in the subjective experiences of our two cohorts (Illeris, 2007). The QS students had experience of working in industry and the expedience required in project work. The architecture students spent most of the early weeks of the project analysing the site and evaluating the design problem. Those architecture students taking a problem based approach could not produce an outline design within the short time frame, which became a cause of frustration for the QS students, as the information exchanges were vital in the limited 9 week programme. For those architecture students who had not been exposed to work placements or work experience within the industry the process of working with the Qs was over overwhelming, where a rapid reframing of their expectations, and expectations of them as students had to be undertaken. For the QS students already benefitting from work experience, it was harder to necessarily realise a value in the experience of collaboration with the architecture students.

Designing is identified as being different from other disciplines and has its own designerly ways of practice (Cross, 2006). Intrinsically linked to other professions it is critical in designing projects in a multi or interdisciplinary curriculum. Yocom et al. (2012) focus on an interdisciplinary framework for planning and design, and it is such a framework that would enable built environment education more widely to adopt cross disciplinary teaching, without compromising student expectations of a professionally accredited course. Interdisciplinary working, the breaking down of defined discipline barriers, with teams working towards the same goal through a shared ambition are raised as

critical aspects of a successful project (Wenger, 2009). The concept of multidisciplinary learning is neither new or ground breaking, but one that appears to be constantly under pressure in higher education from the diverse demands of the NSS, employability, external income generation, timetables, physical resources, risk adverse culture, employer remits and targets. Multidisciplinary projects where planning and architecture students, or landscape architecture and architecture students, work on a live project are more commonly found in studio teaching – where a shared design language and understanding lessen the opportunity for miscommunication.

Students unable to realise that they were experiencing a reality of group work - such as lack of timely information and group members not meeting deadlines - perceived the assessment as not well organised. This could be avoided by improving the module delivery to incorporate a session for all students to discuss together the nature of multi or interdisciplinary group work, and in particular to discuss anticipated problems and how they might be overcome – collaboratively, through developing a common language or goal. Chapman (2009: 24) argues that built environment education can be developed as a 'social practice', collectively developing ideas that situate the built environment within the context of our lived experiences, he goes on to say:

The simple conclusion is that integration of analysis and problem-framing between disciplines is an essential precursor to any possible integration of decision-making. It is this that has the most transformative potential in interdisciplinary built environment education (Chapman, 2009: 24)

Farrell pushes this further and calls for “a common foundation year, learning about all the built environment professions, followed by alternative pathways” (Farrell, 2014: 16). The practice of common modules within the first year is currently adopted within our institution, and is not an uncommon model.

Buildings take a long time to conceive, construct and inhabit. The designing and construction of our built environment must take time, and be viewed as a holistic process with an impactful outcome (Fox, 2009: 18). Whether the professional institutions or individual professionals are the most effective agents for change remains in debate (Hill et al., 2012) as does the role of higher education in addressing the call for change within the industry. Change should start at university, and it is vital that teaching reaches across professional territories and is embedded in higher education alongside a holistic approach to design which addresses society, developing agency within the professions beyond process (Petrescu et al., 2009).

6. CONCLUSION

This initial attempt at collaborative delivery between QS and architecture did not continue as hoped in 2015/6 due to a staffing change. Last years costed work has helped to inform this year's architecture students. It is planned to revise and strengthen the collaboration for 2016/17 and to programme in more opportunity for true multidisciplinary working where the BAU model is challenged and a new mode of interdisciplinary working developed, involving the QS students earlier and with clearer targets and ambitions for the architects - working together to resolve cost and design issues collaboratively rather than confrontationally. It is intended to take a more robust approach to assessment in future occurrences, increasing measures to improve the student experience and to overcome the issues discussed. It could be assumed student panic could be lessened if the

assessment comprised of formative assessment only, which would require additional measures to ensure student engagement. In particular, in the absence of the link between formal assessment and participation in the module, students may lose their interest to engage, particularly if the process of producing design information is cumbersome or untimely. Ultimately this may result in students not achieving the intended outcomes and students not using the workshop time effectively.

The project raised questions including the importance of supported student learning, the degree of student panic (for both groups), and students not realising the realism of the process. Important issues to address in the future include: managing student numbers in groups and the physical space more effectively, managing student expectations of each other, and balancing assessment, reward, and engagement. Part-time QS students found it difficult to work with full-time architecture students who had less professional experience. In reality construction professionals work with other professionals of varying levels of experience and commitment. The impacts of this are measured differently within professional life, where performance is collectively assessed as a team, and student life, where performance is finally assessed on an individual basis. The degree of autonomy did not match with the degree of professionalism, commitment and focus. It was only after the module that the architecture students found their professional 'voice'.

The challenge for the built environment disciplines is to move away from prescriptive silo delivery in higher education. To develop experiences for learning and transformation through problem solving and interdisciplinary working, providing opportunities for learners to collaborate or at least share a common goal. Working with a live project offers an opportunity to develop a budget, get feedback, replicate client interactions, presentations, and welcome the wider community into the studio. However the external and internal pressures on students, especially part time students or students studying full-time and working part time must be recognised. An over-reliance on other students to complete group work can be perceived as potentially damaging to degree outcomes, and (more) importantly to student morale. Particularly critical when student groups are about to undertake the NSS.

As well as risk averse students, staff are increasingly risk averse and may not want to take on a module with problematic assessment processes and concerning evaluation. This can result in a return to a BAU approach we have so long argued against – which will continue to permeate through the industry.

The quote below is 50 years old, still a common sentiment today.

The mistake, common today, that the duty of the professor is fulfilled if he has changed the course structure, introduced a few more subjects early in the course, found the money (if not the inspiration) for research, is a disastrous one. For we should be concerned with evolving live new functions in the schools, not replacing one dead structure by another (Ritter, 1966: 197).

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